



Original Article

Determinants of Nutritional Status among Mothers and their Children of Age 6–59 Months

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ABSTRACT

Objectives: The main aim is to study the determinants of nutritional status among mothers and their children aged 6–59 months in Nepal's Panauti municipality.

Material and Methods: A descriptive and cross-sectional study was conducted among 226 mothers and their children 6–59 months residing in ward no. 1, 2, and 4 of Panauti Municipality. A combination of a semi-structured questionnaire and anthropometric measurements was used to assess various determinants of nutritional status. A Chi-square test was used to check the association between variables.

Results: The study found that the prevalence of maternal underweight was low (2.7%) whereas the prevalence of overweight and obesity was 36.7% and 13.7%, respectively. Around 27.9% of the children were severely stunted, 3.6% underweight, and 3.5% wasted, whereas 22.1% of the children were overweight. About 54% of the mothers and 57.52% of the children were malnourished. Ethnicity was significantly associated with mothers' nutritional status and factors such as ethnicity, pre-lactal feeding, and cultural practices of the mother were significantly associated with the nutritional status of children.

Conclusion: The study concluded that more than half of the mothers and children were malnourished. Demographic factors-like ethnicity were significantly associated with the nutritional status of mothers and children, whereas factors like pre-lactal feeding and cultural practices of the mother were significantly associated with the nutritional status of the children.

Keywords: Balanced diet, Child health, Maternal health, Malnutrition, Overweight

INTRODUCTION

Proper nutrition indicates a good quality of life and makes people more productive in their day-to-day lives. Better food leads to good health characterized by a more robust immune system and low occurrence of illness.^[1] Poor nutrition may reduce immunity, increase susceptibility to disease, impair physical and mental development, and reduce productivity. Nutrition is one of the significant determinants of health and it is influenced by certain demographic, social, and cultural factors, food habits, food security, and so on.^[2] Dietary intake/food habit is one of the immediate determinants, whereas age, sex, occupation, ethnicity, and religion are some of the

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variables that influence nutritional status in the long run. The availability of adequate, safe, and nutritious food to maintain active life is known as food security (even during crisis and seasonal shortages). Food security is crucial in determining nutritional status.^[3] Poor access to food, particularly during pregnancy and lactation, leads to undernutrition and increase the risk of low birth weight, childhood stunting, and anemia in mothers.

On the other hand, the overconsumption of food/calories is linked to overweight and obesity, as seen in middle and high-income countries.^[4,5] It is also evident that food insecurity can contribute to overweight and obesity because nutritious food tends to be expensive; thus, people choose less expensive food, often high in calories and low in the required nutrients. Different psychosocial factors link obesity with food insecurity because it causes feelings of anxiety, stress, and depression, leading to behaviors that increase the risk of cardiovascular disease.^[3,5]

Maternal and child undernutrition contributes 10% to the total global burden of disease and is also responsible for more than one-third of child deaths. Poor nutritional status of children and mothers has long-term health consequences, and the ramifications extend to inter-generational low productivity and perpetuation of poverty.^[6] Malnourished children are highly susceptible to disease, and global literature has revealed that 45% of under-five deaths are due to undernutrition. Therefore, reducing underweight can be an essential step toward reducing childhood morbidity and mortality.^[1,2] As documented in scientific literature, Nepal has a very high rate of child malnutrition. About 36% and 27% of children aged below 5 years are stunted and underweight, respectively, and about 17% of women of reproductive age have chronic energy deficiency (body mass index [BMI] <18.5) and 41% are anemic.^[7] In contrast, overweight and obesity are rising problems in Nepal. About 22% of women of reproductive age and 1% of children below 5 years are overweight in Nepal, as documented by the national demographic health survey 2016.^[8] Since improper nutrition is evidenced through various statistical references cited above, the current research aims to study the determinants of nutritional status among mothers and their children aged 6–59 months in Nepal.

MATERIAL AND METHODS

Ethical consideration

Administrative approval was sought from the concerned authorities of HOPE International College and Panauti Municipality (Ward number 1, 2, and 4) and written informed consent was obtained before starting the data collection. All the participants were informed of the purpose and procedure of the study. Privacy, confidentiality, and anonymity of participants and data were maintained throughout the study.

Design, duration, site, and required sample size for the study

This was a cross-sectional descriptive study conducted among women with children 6–59 months during data collection. The study was conducted for 13 months from November 2018 to November 2019 in the selected ward numbers: 1, 2, and 4 of Panauti Municipality, Kavreplanchowk, Nepal. The required sample size of the study was reached based on the prevalence of undernutrition in Nepal and determined by:

$$n = \left[\frac{Z\alpha}{E} \right]^2 PQ$$

Where,

n = Desired sample size

$Z_{0.05}$ = Z at α (0.05) = 1.96

P = Prevalence of undernutrition in women of reproductive age in Nepal was 17% (In Nepal Demographic and Health Survey (NDHS) 2016)

q = $1 - P = 1 - 0.17 = 0.83$

e = level of error 5% = 0.05

Hence, desired sample size, $n = \{(1.96)^2 \times 0.17 \times 0.83\} / (0.05)^2 = 216$

Keeping a 5% non-response error, the minimum required sample size was = 226

Inclusion and exclusion criteria

The mothers of children aged 6–59 months, who understood the Nepali language and were willing to participate in the study were enrolled after obtaining their written consent. The mothers with psychiatric issues, terminal illness, insufficient time for completion of the study, and emergency health conditions of their children were excluded from the study.

Development and validation of research tools

A translated version of the investigator-prepared validated questionnaire and household food insecurity assessment scale (HFIAS) in the Nepali language were used to collect the relevant information. A semi-structured questionnaire comprising 71 questions divided into seven different sections was developed. Different types of primary, secondary, and tertiary sources of information were used for preparing the questionnaire. The different sections in the questionnaire were: Part I (Sociodemographic details, ten questions), Part II (Information on mother, 12 questions), Part III (Information on children, 16 questions), Part IV (Food habits of the mother, 15 questions), Part V (Food habits of children, four questions), Part VI (Household food insecurity, ten questions), and Part VII (Cultural practices, four questions). The content of the questionnaire was validated by the research supervisor, research advisors, public health teachers, and

public health experts. The suggestions made by the experts were incorporated and the final version of the questionnaire was prepared in English. The final English version of the questionnaire was translated into the Nepali language by a professional English-Nepali language translator. The translated Nepali version of the questionnaire was translated back to English by two English teachers to confirm the accuracy. The Nepali version of the questionnaire was pre-tested by conducting face-to-face interviews among the respondents residing in ward number 3 of the Panauti municipality. The HFIAS comprised nine questions reflecting three different domains of food insecurity and the standard scale was used as referenced in the scientific literature.

Data collection tools and techniques

Two separate tools were prepared to gather relevant information from the study respondents. A semi-structured questionnaire was used to collect the details pertinent to the various factors associated with the nutritional status of the mother and their children by performing face-to-face interviews. Another form was developed to record anthropometric measurements, including the height and weight of the mother and their children.

Measurement of variables

Height/Length

The length of each child aged 6–12 months was taken using a baby scale device. The length was read to the nearest 0.1 cm. The height of the children aged above 12 months and mothers was measured in standing positions by following all the standard procedures.

Weight

The weight was measured using a weighing scale and was read to the nearest 0.1 kg after removing footwear and heavy jewelry, ensuring minimum clothing was worn. For children who were unable to stand, weight was obtained from the difference between the mother's values of weight with and without their child.

Data management, statistical analysis, and interpretation

The collected data were reviewed, checked, coded, and organized to reduce errors and entered in Epidata and later transported to the social sciences statistical package (SPSS Version 22.0). The data were analyzed using the descriptive statistics method and the results were expressed in terms of frequencies and percentages. The association/relation between different variables and expected outcomes were analyzed using the Chi-square test.

The nutritional status of mothers was identified by calculating BMI and categorized as:

1. Underweight: $<18.5 \text{ kg/m}^2$
2. Normal: $18.5\text{--}24.9 \text{ kg/m}^2$
3. Overweight: $25\text{--}30 \text{ kg/m}^2$
4. Obese: $30\text{--}40 \text{ kg/m}^2$
5. Extremely obese: $>40 \text{ kg/m}^2$.

The nutritional statuses of children were identified using Z-scores and categorized as

1. $<(-3) =$ Severe
2. $(-3)\text{--}(-2) =$ moderate
3. $-2\text{--}2 =$ Normal
4. $>2 =$ Overweight (in case of underweight and wasting).

RESULTS

Distribution of study respondents based on sociodemographic details

Out of 226 respondents, the majority (48.7%) belonged to the 24–29 age group, followed by 32.3% in the 19–24 age group. About 79.6% belonged to the nuclear family while 3.1% belonged to the extended family. Among the respondents, 78.3% were Hindu and only 2.2% were Christian. The highest number of respondents was Brahmins (41.6%), whereas only 4.9% belonged to other categories like Dalits. Most respondents (91.2%) and their husbands were literate and had completed education up to the secondary level (38.9%). Most of the mothers were housewives (57%) and their husbands were engaged in agriculture (27.4%) and had an annual family income of less than NRs. Most of the mothers were housewives (57%) and their husbands were engaged in agriculture (27.4%). Majority (86.7%) of family had an annual family income of less than NRs 50,000. About 62.8% got married between the ages of 19 and 24 and had only one child. The details on sociodemographic parameters are shown in [Tables 1a and 1b].

Distribution of respondents based on their information during pregnancy

The majority of the respondents had consumed adequate food (95.1%) during pregnancy and had good health status (94.2%). Most of the respondents 97.8% had antenatal checkup visits, 64.25% completed it as per the protocol and 92.9% delivered their children at a health facility while 6.6% of them delivered their child at home. About 73.9% of mothers completed their postnatal checkups after delivery. The details are shown in [Table 2].

Distribution of respondents based on their children's information

The majority of the children were males (50.9%) and belonged to the 6–24 (59.3%) months group. About 61.9%

Table 1a: Sociodemographic details of study respondents.

Variable characteristics (n = 226)	Frequency (n)	Percentage
Age-group of respondents		
19–24	73	32.3
24–29	110	48.7
29–34	32	14.2
34–39	4	1.8
39–44	2	0.9
Number of family members		
3–7	180	79.6
7–11	39	17.3
11–15	7	3.1
Religion of respondent		
Hindu	177	78.3
Buddhist	44	19.5
Christianity	5	2.2
Ethnicity of respondents		
Chhetri	42	18.6
Brahmin	94	41.6
Tamang	54	23.9
Newar	25	11.1
Others	11	4.9
Literacy status of respondents		
Yes	206	91.2
No	20	8.8
Education level of respondent		
Primary level	34	15.0
Lower secondary level	56	24.8
Secondary level	88	38.9
Bachelor's degree and above	28	12.4
Education level of spouse		
Primary level	27	11.9
Lower secondary level	61	27.0
Secondary level	85	37.6
Bachelor's degree and above	40	17.7

of the mothers had two or more children with an average spacing of 10–26 months. The majority of the children were above 2.5kg when delivered and were fed with colostrum; 95.1% and 92% of them were breastfed immediately after birth. Children were breastfed for more than 4 times (69.9%) in most of the cases after proper handwashing (97.2%). Half of the children were fed with food other than breast milk during their prelacteal period, whereas most of them had complementary food after 6 months of birth. Two-thirds of the children completed the immunization on the schedule and 98.7% of the children were free from the disease.

Distribution of respondents based on their food habits

The majority of mothers (91.6%) consumed 3–4 meals/day throughout the week. 97.8% had Rice (Bhat), pulses (dal), and curry and vegetables (Tarkari) as their main meal. About 90.7% had vegetables and fruits 1–2 times/day. Around 90%

Table 1b: Sociodemographic details of study respondents.

Variable characteristics (n = 226)	Frequency (n)	Percentage
Occupation of respondent		
Housewife	129	57.1
Agriculture	62	27.4
Business	14	6.2
Service	17	7.5
Others	4	1.7
Occupation of Spouse		
Agriculture	62	27.4
Business	37	16.4
Labor	52	23.0
Service	48	21.2
Foreign employee	27	11.9
Household monthly income		
1000–50000	196	86.7
50000–100000	27	11.9
100000–150000	2	0.9
150000–200000	1	0.4
Age during marriage		
14–19	68	30.1
19–24	142	62.8
24–29	16	7.1
Number of children given birth to		
One	140	61.9
Two	68	30.1
Three	14	6.2
Four	4	1.8

of respondents were found to have skipped their breakfast. Slightly above the half (50.9%) of the mothers were unaware of the food pyramid, whereas 11.1% had complete knowledge. Three quarters of respondents had the habit of drinking tea, and 98.2% of them were non-alcoholic. About 20.8% of the respondents always considered the nutritional value of food. Nepali food was the most liked type of food by 92.5% of them. More than half (58.4%) of the respondents preferred to eat junk food, of which the majority 87.88% preferred noodles and biscuits. The details are shown in [Table 3].

Distribution of respondents based on their children's food habits

The majority of children (69.9%) were fed daily with dal, bhat, and tarkari as the main meal while 70.4% were fed fruits and vegetables 1–2 times a day. About 87.6% were fed with bread/cereals or potato 1–2 times a day. Most of the children were fed dairy products. The details are depicted in [Table 4].

Household food security

[Table 5] shows the details of food security. About 92% of the subjects responded that they had good food security. About 94.7% of households were not found to have the inability to

Table 2: Information about mothers during pregnancy.

Variable (n = 226)	Frequency	Percentage
Adequate food during pregnancy		
Yes	215	95.1
No	11	4.9
Health during pregnancy		
Good	213	94.2
Sick	13	5.8
Antenatal checkup visit		
Yes	221	97.8
No	5	2.2
Number of visits (n = 221)		
Three times	16	7.23
Four times	142	64.25
More than 4 times	60	27.14
Others	4	1.81
Place of delivery		
Health Centre	210	92.9
Home	15	6.6
Others	1	0.4
Presence during delivery at home (n = 16)		
SBAs	9	56.25
Family members	7	43.75
PNC visits		
Yes	167	73.9
No	59	26.1
Number of visits (n = 167)		
One time	134	80.23
Two times	20	11.98
Three times	7	4.19
More than 3 times	4	2.3

SBAs: Skilled birth attendants, PNC: Post natal care

eat, 92.5% did not experience limited types/supply of food, 94.2% did not eat less than required food, and 94.7% did not experience scarcity of food in the house in the past 4 weeks. The details are shown in [Table 5].

Distribution of respondents based on cultural practices

The majority of respondents (96.9%) celebrated Dashain and Tihar as main festivals, followed by (79.2%) that celebrated Janai Purnima, and only 2.2% celebrated Christmas. About 99.1% had a change in their diet during these festivities. The most consumed food items during these times were sweets (93.8%), meat (93.4%), and a mixture of pulses (82.3%). The majority of the responders (35.4%) did not prefer to eat buff, followed by pork (32.7%), chicken and mutton (18.6%), and garlic and onion (13.7%) due to their cultural practices. The details are shown in [Table 6].

Nutritional status of mothers and their children

The majority of the mothers 46.5% who participated in the survey had a normal BMI, 36.7% were found overweight,

Table 3: Distribution of respondents based on their food habits.

Characteristics (n = 226)	Frequency	Percentage
Frequency of meals per day		
3–4 meals/day	207	91.6
1–2 meals/day	16	7.1
5–6 meals/day	3	1.3
Food usually skipped		
Breakfast	203	89.8
Snacks	14	6.2
Lunch	8	3.5
Dinner	1	0.4
Frequency of dairy products consumption per day		
1–2 times a day	166	73.5
Never	52	23.0
3–4 times a day	8	3.5
Knowledge about food pyramid		
No idea	115	50.9
Not much	46	20.4
Well	40	17.7
Very well	25	11.1
Care of nutrition in food		
Sometimes	70	31
Rarely	61	27
Never	48	21.2
Usually	47	20.8
Consumption of junk food		
Yes	132	58.4
No	94	41.6
Types of junk food consumed (n = 132)		
Noodles and Biscuits	116	87.88
Momo and Chowmein	11	8.33
Chatpate and Panipuri	5	3.8

Table 4: Distribution of respondents based on their children's food habits.

Characteristics (n = 226)	Frequency	Percentage
Main meal of child		
Dal, bhat, and tarkari	158	69.9
Lito	62	27.4
Others	6	2.7
Feeding the child with fruits and vegetables in a day		
Never	13	5.8
Sometimes	27	11.9
1–2 times a day	159	70.4
3–4 times a day	27	11.9
Feeding child with bread/cereals/potato in a day		
Never	24	10.6
1–2 times a day	198	87.6
3–4 times a day	4	1.8
Feeding the child with dairy products per day		
Never	37	16.4
1–2 times a day	174	77
3--4 times a day	15	6.6

13.7% were obese, 2.7% were underweight, and 0.4% were extremely obese. Most of the children (84.1%) had normal

Table 5: Distribution of details on household food security.

Characteristics (n = 226)	Frequency	Percentage
Inability to eat during the last 4 weeks		
No	214	94.7
Yes	12	5.3
Number of times that happened (n = 12)		
Rarely	5	38.5
Sometimes	8	61.5
limited types of food during the past 4 weeks		
No	209	92.5
Yes	17	7.5
Number of times that happened (n = 17)		
Rarely	6	33.3
Sometimes	11	61.1
Often	1	5.6
Ate less food during the past 4 weeks		
No	213	94.2
Yes	13	5.8
Number of times that happened (n = 13)		
Rarely	4	30.8
Sometimes	9	69.2
Lack of food in the house in the past 4 weeks due		
No	214	94.7
Yes	12	5.3
Number of times that happened (12)		
Rarely	3	25
Sometimes	8	66.7
Often	1	8.3
Have you ever past a day and night without eating food		
No	225	99.56
Yes	1	0.04
Household food security		
Food secure	208	92
Mildly food insecure	9	4
Moderately food insecure	9	4

weight according to their age, 12.4% were moderately underweight, 2.7% were overweight and 0.9% were severely underweight. The details of the nutritional status of children are shown in [Table 7].

Association of various factors with the nutritional status of mothers and their children

In the case of mothers, among several variables, only ethnicity ($P = 0.031$) was a significant factor, whereas other factors such as age-group ($P = 0.161$), religion ($P = 0.13$),

Table 6: Distribution of respondents based on cultural practices.

Characteristics (n = 226)	Frequency	Percentage
Festivals celebrated		
Dashain	219	96.9
Tihar	219	96.9
Janai Purnima	179	79.2
Teej	175	77.4
Buddha Jayanti	51	22.6
Christmas	5	2.2
Change in eating patterns during festivals		
Yes	224	99.1
No	2	0.9
Foods eaten during festivals		
Sweets	212	93.8
Meat	211	93.4
Kwati	186	82.3
Foods prohibited by their culture		
Buff	80	35.4
Pork	74	32.7
Chicken and mutton	42	18.6
Garlic and Onion	31	13.7

Table 7: Nutritional status of children.

Characteristics (n = 226)	Frequency	Percentage
Weight for age		
Severely underweight	2	0.9
Moderately underweight	28	12.4
Normal	190	84.1
Overweight	6	2.7
Height for age		
Severely stunted	63	27.9
Moderately stunted	40	17.7
Normal	123	54.4
BMI for age		
Severely wasted	3	1.3
Moderately wasted	5	2.2
Normal	168	74.3
Overweight	50	22.1

literacy ($P = 0.42$), education ($P = 0.46$), education of husband ($P = 0.05$), occupation ($P = 0.17$), occupation of husbands ($P = 0.42$), monthly family income ($P = 0.08$), food habit ($P = 0.60$), household food security ($P = 0.38$), and cultural practices ($P = 0.24$) were not associated with the nutritional status of mother.

In the case of children, ethnicity (0.016), prelacteal feeding ($P = 0.005$) and cultural practices of mother ($P = 0.009$) were found significantly associated, whereas maternal factors such as age-group ($P = 0.47$), religion ($P = 0.15$), extra food during pregnancy ($P = 0.396$), health during pregnancy ($P = 0.38$), ANC visits ($P = 0.30$), place of delivery ($P = 0.52$), PNC visits ($P = 0.43$), maternal nutritional status ($P = 0.71$) and

children's characteristics like age ($P = 0.52$), sex ($P = 0.16$), birth spacing ($P = 0.83$), birth weight ($P = 0.81$), colostrum feeding ($P = 0.82$), time for breastfeeding ($P = 0.91$), frequency of breastfeeding ($P = 0.95$), and diseases in the past month ($P = 0.84$) were found to have no statistical significant association with nutritional status of children. The complete details on the associated factors with mothers and their children's nutritional status are shown in [Table 8] (only statistically significant parameters are shown).

DISCUSSION

The prevalence of women who are underweight and having children aged 6–59 months shown in the study is 2.7%, which is <17% that of the value of the national prevalence of undernutrition among women aged 15–45 years as per NDHS 2016.^[8] Similarly, the prevalence of overweight women in Panauti Municipality was found slightly higher than the national prevalence of 22%.^[8,9] The prevalence of undernutrition in women concluded by this study is much lower 26.7% in comparison with the study carried out in Madagascar by Ravaoarisoa *et al.*^[10] The prevalence of overweight and obesity is lower than that of overweight (45.6%) and obesity (18%) in a study conducted in Khartoum.^[11] The prevalence of underweight, stunting and wasting in children aged 6–59 months was 13.3%, 45.6%, and 3.5%, respectively, in Panauti municipality, which is comparatively less than the prevalence of underweight at

20.8%, stunting at 53.9%, and wasting 10.6% mentioned in a study conducted by Dhungana.^[12] In the context of countries other than Nepal, the prevalence of stunting is similar to the study conducted in Haryana, India. However, the prevalence of underweight and wasting found in the present study is lower than that of the results of a survey carried out in Ethiopia, which were 19.5% and 17.5%, respectively.^[13,14]

The present findings showed a high prevalence of overweight children (22.1%) aged 6–59 months, in comparison to the national data (1% of NDHS 2016).^[8] The present value is found nearly similar to the value of prevalence in a study carried out in Ethiopia (23.36%). Using the chi-square test, the mother's ethnicity was found to have a statistically significant association with the mother's and children's nutritional status. The present study presented no considerable variation in children's nutritional status according to their gender; similar findings were presented in a survey conducted in Padampur VDC, Chitwan.^[15] Similarly, the study showed no association between age and nutritional status in both cases of mothers and children, and this contrasts with the research conducted in Khartoum as well as in Nepal.^[11,12]

The study showed that mothers' nutritional status had a significant association with ethnicity, while children's nutritional status had a significant association with different characteristics such as; ethnicity, pre-lacteal feeding, and cultural practices. This result is also supported by many other

Table 8: Association of various factors with the nutritional status of mothers and their children.			
Characteristics	Nutritional Status		χ^2 Significance (P-Value)
	Normal	Malnourished	
Demographic Variable (n = 226)			
Association of variables with nutritional of mothers			
Ethnicity			0.031*
Brahmin	40	54	
Chhetri	13	29	
Tamang	31	23	
Newar	13	12	
Others	8	3	
Association of variables with nutritional of children			
Ethnicity			0.016*
Brahmin	36	15	
Chhetri	27	58	
Tamang	20	34	
Newar	10	14	
Others	2	9	
Prelacteal feeding			0.005*
Yes	31	67	
No	64	63	
Cultural Practices of mothers			0.009*
Poor cultural practices	21	50	
Good cultural practices	74	80	

*Statistically significant $P < 0.05$

studies, such as the study conducted in Madagascar, Gorkha, Haryana, Ethiopia, and Kenya.

CONCLUSION

The study concluded that nearly half of the mothers involved in the study had normal BMI; more than one-fourth of mothers were overweight and slightly less than one-fourth of mothers were obese. More than one-fourth of the children were severely stunted, 3.6% were underweight, and 3.5% were wasted. Nearly one-fourth of children were overweight. More than half of the mothers and children aged 6–59 months were malnourished. The study also showed a significant association of ethnicity with the nutritional status of mothers. Similarly, factors including ethnicity, pre-lacteal feeding, and cultural practices of the mother were significantly associated with the nutritional status of children aged 6–59 months. This study showed the nutritional status of mothers and children and the more significant fraction of mothers and children being malnourished.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

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